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22. METAL FOUNDING,

Molded-molds.

Chains, hinges & joints.

N^o 19,907



A.D. 1896

Date of Application, 9th Sept., 1896

Complete Specification Left, 9th July, 1897—Accepted, 5th Sept., 1897

PROVISIONAL SPECIFICATION.

Improvements in and relating to the Method of and Means for Manufacturing the Frames and Other Parts of Cycles, Motor Cars, and other Vehicles also Applicable for other Industrial Purposes.

We JOSEPH JOHN BRADLEY of 16, Buckingham Street Birmingham Metal Caster FRANZ WILLIAM POPP of 28, Ludgate Hill Birmingham Merchant and WILFRED VAN WART of 582, Moseley Road Birmingham Metal Merchant, do hereby declare the nature of this invention to be as follows:—

- 5 This Invention has for its object a new method of joining together Tubes or other loose pieces made of Aluminium or of alloys of Aluminium or of any other metal by means of joints made of Aluminium or of any alloys of Aluminium and our improvements chiefly apply to the manufacture of Tubular & other Frames made of Aluminium or of Aluminium alloys for cycles motor-cars & other
10 Vehicles but we may use it for all other suitable purposes where joints are required.

- We propose to make our improved joints principally by means of a method of casting in sand or other suitable moulds. In the case of Tubes we join the same by casting the joints on to the ends of the Tubes in the sand or other moulds. In many cases the Tubes which we shall use in Conjunction with this method of
15 joining will be our special Tubes which are made of a particular alloy of Aluminium & which are prepared on the surface at the ends which are to be joined by cutting circular rings or indentations around the same at certain distances apart & also cutting indentations a certain distance longitudinally in the tube ends so as to afford a roughened surface for the metal composing the joint to bind
20 & obtain a firm hold and the object of this is that when the molten metal is poured into the mould it adheres much more firmly to the roughened surface than it would to the smooth surface of an ordinary Tube.

- Besides the above mentioned or other method of roughening we shall in certain cases slightly flange or turn out the ends of the Tubes which we propose joining
25 as this will absolutely prevent the joints from pulling off the Tubes. We shall also make use in the manufacture of these joints of a special method of stopping off the flow of metal when casting the joints on to the Tubes which method not only causes the joints to be of the lightest possible weight but also adds considerable strength to the joints & prevents any of the parts forming the same from
30 becoming loose.

We also adopt a special method of making the moulds & the pattern for the moulds for the joint which will take the place of what is usually termed the bottom bracket upon a safety bicycle frame.

In certain cases we shall cast pieces or parts of steel or other metals into certain
35 portions of the joints.

Our Invention completely obviates the necessity of joining together loose parts of Aluminium or of Aluminium alloys by means of brazing (which process of brazing as regards Aluminium has never been a success) as our improved joints are cheaper & stronger than brazed ones would be. We shall also utilize the

[Price 8d.]

Improvements in Manufacturing the Frames and Other Parts of Cycles, &c.

before described improved cast joint which will generally be made of Aluminium or of any alloy of Aluminium which we may find suitable for the purpose of joining together tubes or other loose pieces made of steel or any other metal by means of cast joints of any description made with Aluminium or with any alloy of Aluminium whatsoever.

By using these or other cast joints for connecting the steel Tubing *etc.* used in cycle & motor-car frames we shall be able to produce the same by which all or part of the Tubular portion will be of steel but where all or some of the joints will be of Aluminium or of an alloy of Aluminium the frames made by this method will be lighter than those made entirely of steel, or iron, and at the same time cheaper than the methods hitherto employed for joining steel Tubes by brazing them into brackets.

Dated this 8th day of September 1896.

EDWD. J. PAYNE & SON,
Warwick Chambers, 104, Colmore Row, Birmingham,
Patent Agents for the Applicants.

COMPLETE SPECIFICATION.

Improvements in and relating to the Method of and Means for Manufacturing the Frames and Other Parts of Cycles, Motor Cars, and other Vehicles also Applicable for other Industrial Purposes.

We, JOSEPH JOHN BRADLEY of 16, Buckingham Street Birmingham Metal Caster, FRANZ WILLIAM POPP of 28 Ludgate Hill Birmingham Merchant and WILFRED VAN WART of 582, Moseley Road, Birmingham Metal Merchant, do hereby declare the nature of this Invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement and with reference to the Drawings

Our Invention has for its object a new method of joining together tubes or other loose pieces such as form Cycle frames made of Aluminium or of such Alloys of Aluminium as are principally composed of the same by means of joints lugs or brackets made of Aluminium or in its alloyed form. It has been found that in consequence of its low melting point and other difficulties which are practically insuperable, Aluminium or its alloys are almost impossible to braze or solder successfully.

This fact has been greatly against the use of Aluminium and its alloys more especially as regards the manufacture of cycle frames from tubing of Aluminium or of Aluminium alloys (which metals owing to their extreme lightness are particularly suitable for this purpose), as there has always existed great difficulty in making the joints. Now by our present Invention we are enabled to overcome this difficulty and our improvements chiefly apply to the manufacture of tubular and other Frames made of Aluminium or of Aluminium alloys for Cycles Motor Cars and other Vehicles but we may employ our method for all other suitable purposes where joints are required. Fig. 1 represents an interior plan view of a mould shewing the tubes and junction lugs of a cycle head in section. The joints or lugs for other parts of the frame will be cast in similar manner in suitably shaped moulds.

We first of all in making a tubular frame prepare the tubes on the surface of the ends which are to be joined in a special manner namely by cutting circular rings or indentations around the same at certain distances apart and also by cutting indentations a certain distance longitudinally in the tube ends so as to

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afford a roughened surface for the metal composing the joints to key into and bind in order to obtain a firm hold seen in elevation Fig. 2. For the purpose of producing our improved joint we employ Sand Moulds made from casting patterns A or other suitable moulds composed of metal and known as chills into which the prepared tubes B as before described are placed, the joints C being formed and completed by the flow of molten metal which is poured into the mould at D and flows around the tubular ends thus forming the junction. It will be apparent that the object of roughening the ends of the tubes B as at E is that when the molten metal is poured into the mould it adheres much more firmly to the roughened surfaces than would be possible to the smooth surfaces of the tubes.

Besides the above we can use other methods of roughening the ends of the tubes or other members to be jointed together.

In order to still further increase the strength and utility of our joint when applied to tubing in certain cases we slightly flange or turn out the ends of the tubes E' to be joined as this will effectually prevent the joints from pulling off the tubing or the tubing from pulling off the joints.

In the manufacture of the joints above described we also employ a method of stopping off the flow of metal within when casting the joints onto the tubes as follows.

Discs of metal or plugs of sand or both as at F G Fig. 1 (or discs or plugs of other suitable material) as may be found necessary according to the volume of metal to be used in covering the ends of the tubing will be inserted so as to exclude the molten metal when casting the joints, thus saving waste of metal whilst retaining all the advantages previously described, especially as to lightness of weight.

Fig. 3 represents in elevation a forked end of a back stay shewing our improved joint partly in dotted lines.

In regard to the casting of the pieces or parts shewn in this fig. we take a steel casting of the fork I and insert the part I' into a tube J of Aluminium or alloyed Aluminium so as to fit tightly, the whole joint is then drilled in one or more places K so as to provide a way for the flow of metal around the joined parts.

After the casting mould has been prepared similarly to other sand moulds, the parts I J are laid in position in the requisite impressions for casting a band L of metal to form a joint which is the more effectually held in position by reason of the plugs that obviously are formed in the drilled apertures K during the casting of the band L and which are integral with said band so cast, and the whole joint is then one united mass.

In certain cases we cast or fit pieces or parts or sections of steel tube or other metals in certain portions of the joints, lugs or bottom brackets. Fig. 4 represents in sectional elevation a bottom bracket constructed in accordance with our invention.

In this case a piece of steel tube M may be cast or fitted into the cast recess M' which receives the axle pin of the chain wheel and by preference a section of split steel or other tube M is inserted and which is kept in position by its natural spring, the back stay tubes and their lugs and the diagonal stay and lug are formed in connection with the bottom bracket by means of a suitably shaped mould as already described with regard to Fig. 1, other joints and lugs of the framing than those above described are produced in like manner. Our improved joints or junction lugs and brackets thus formed possess the following advantages, great strength is obtained by reason of their perfect formation and they are practically homogeneous with the parts joined. The joined portions of a cycle frame or other article are even stronger than the other portions, no expensive plant or machinery is required for the manufacture of the joints, thus they can be produced at minimum cost so that a Cycle Frame of Aluminium or of its alloys made with these joints can be produced at the same price as a steel frame, the process of brazing steel frames and of finishing same when brazed is expensive, whilst our improved joints require no brazing and less cost in finishing.

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The following are the scientific reasons for the perfect and homogeneous character of the joints produced under our Invention.

First. Aluminium and such of its alloys as are principally composed of Aluminium contract more when cooling after heating or melting than any other metal in general use, by casting our joints round the tubing we take the fullest advantage of this contraction our method of running on the molten metal to form the joint contracts round the tubing during the cooling process and grips it rigidly.

Second. When the molten metal forming the joint is run on to the tubing the heat of it slightly melts or fuses the surface of the Aluminium Tubing which melted or fused portion becomes combined with the molten metal of the joint and perfectly solders the joint and the tube together thus gaining the homogeneous quality which we claim for the joint.

We have therefore by utilising the above special qualities of Aluminium namely, the great Contraction and the slight fusing of the surface of the tubes or other pieces of Aluminium when the molten metal is poured round it, in conjunction with our special methods of roughening and flanging out the ends of the tubes to be joined formed a joint which in the case of Cycle Frames obviates the necessity of any soldering whatever and which is as perfect as any soldered or brazed joint, as it is fixed to the tubing in four distinct ways namely, by the contraction, by the fusing, by the roughening of the tube ends and by the flanging or turning out of the said ends.

The metal of which our joints will preferably be made is our patent metal "Vestadium" described in our Specification of Patent No. 12287 of 1896 and for cycle frames the tubing usually employed will be of this metal.

We also utilize the before described cast joint of Aluminium or of any alloy of Aluminium of which Aluminium forms the base or principal part for the purpose of joining together tubes or other loose pieces made of steel or any other metal.

Steel tubing can be made into cycle frames by means of these joints and such frames will possess great advantages over frames made throughout of steel as they will be lighter and much cheaper, the cost of making and finishing being much less than that of making up steel frames in the usual manner by brazing the tubing into lugs or brackets and finishing them afterwards which is a lengthy and expensive process.

Having now particularly described and ascertained the object and nature of our said Invention and in what manner the same is to be performed we desire to be understood that we do not limit ourselves to the more precise details as herein set forth as we may find it expedient to vary the same without departing from the essential elements of our said Invention but we declare that what we claim is:—

Firstly. In the frames and other parts of cycles motor cars and the like, joining together the tubular or other members forming the frame in the manner and by the means substantially as herein described.

Secondly. In frames for cycles composed of Aluminium or of any alloy of Aluminium, preparing the surface of the ends of the tubular members by forming rings or indentations around same and forming longitudinal indentations therein as and for the purpose described.

Thirdly. Flanging or turning out the ends of the tubular members as and for the purpose described.

Fourthly. In combination with the manufacture of joints for cycle and other frames the employment of Sand moulds or metal moulds known as chills wherein the prepared tubes of Aluminium or its alloys are placed and the method of running molten metal of Aluminium or alloyed Aluminium into said moulds so that it flows around the ends of the tubes and thus forms a homogeneous and rigid joint substantially as described.

Fifthly. In joints of Aluminium or alloyed Aluminium for cycle frames the

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method of strengthening same by casting pieces or tubular parts of steel or other metals into said joints or lugs or bottom brackets in the process of manufacture and in combination therewith as set forth.

Sixthly. In the manufacture of joints of Aluminium or Aluminium alloyed for cycle frames composed of Aluminium or alloyed Aluminium the method of stopping off the flow of metal within. When casting the joints by the use of metal discs or plugs of sand or plugs or discs of other suitable material inserted in the ends of the tubing forming the frame in manner substantially as set forth.

Seventhly. In combination the improvements in and relating to the method of and means for manufacturing the frames and other parts of cycles motor cars and other Vehicles also applicable for other industrial purposes substantially as described.

Eighthly. In the manufacture of the frames of cycles and motor cars and for other purposes the use of steel tubing in combination with the method of connecting the ends of said tubing by joints of Aluminium or Aluminium alloyed substantially as described.

Dated this 9th day of July 1897.

EDWD. J. PAYNE & SON,
Warwick Chambers, 104, Colmore Row, Birmingham,
Patent Agents for the Applicants.

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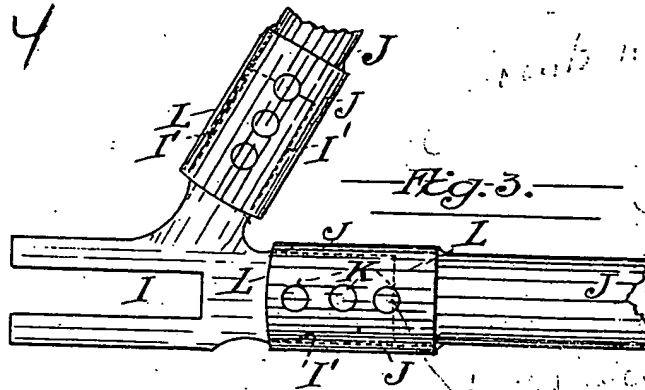


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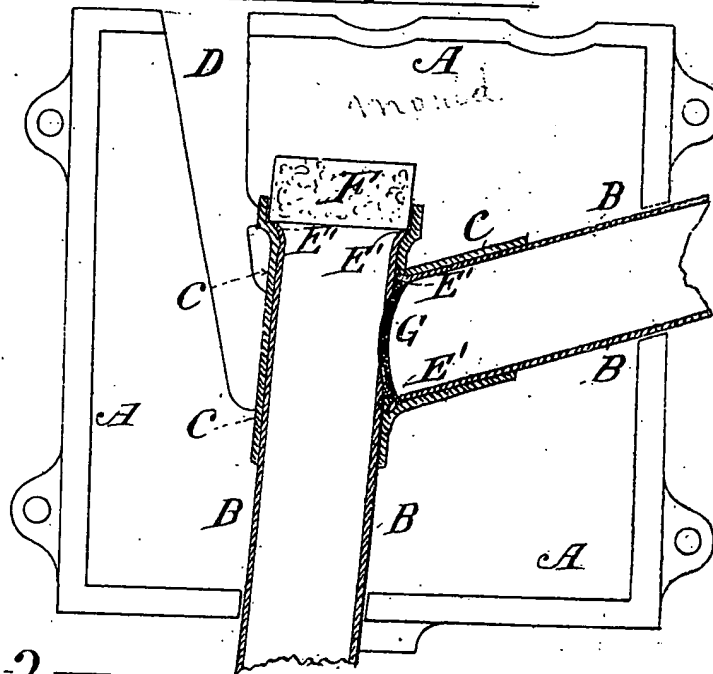


Fig. 2.

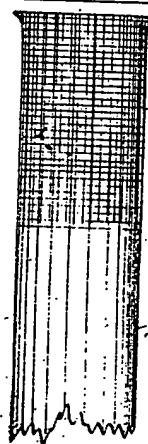
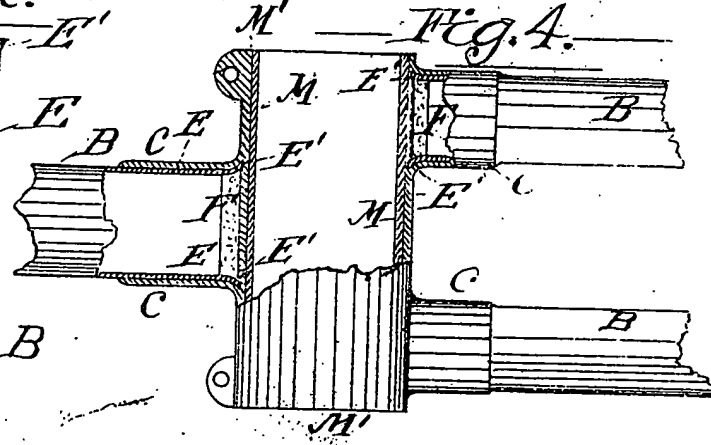


Fig. 4.



[This Drawing is a reproduction of the Original on a reduced scale.]